Dryland Husbandry for Sustainable Development in the Southern Rangelands of Kenya

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Preface

The global perspective of the rangelands, which currently occupy over 51% of the world, is rather worrying because such lands are on the increase since the 1960s when they only comprised about 47% of the earth. These include the drylands or arid and semi-arid lands (ASALs) and the cold deserts. In the Kenyan context, drylands make over 82% of the country and are significant as they are inhabited by over 25% of the population and support over 50% of the cattle, 60% of sheep and goats and 100% of camels.

The plight of Kenya's drylands has been part of the national agenda since the 1960s, when the government undertook specific development initiatives with emphasis on soil conservation and livestock improvement. Over the 1970s–1990s, a lot of effort went into development of the country's drylands through rangeland development programmes with emphasis on research, livestock development and related biotic components such as water, soil and infrastructure. The emphasis was mainly on pastoral and agro-pastoral lands through the top-down approaches characterised by heavy capital investment but with limited impact. International and multinational development agents such as FAO, UNDP and USAID have in the past tried their hand in large scale and in small-impact dryland development projects, but they have been disappointed. To date, it has become increasingly clear that small projects implemented over a long time with heavy local involvement are more effective than those heavy capital, quick-fix and large scale dryland programmes, with little or ephemeral community involvement.

The Dryland Husbandry Project applied the bottom-up approach. A modern scientific process of participatory action research has enhanced the project. It could be termed as a small scale Project. The Project managed to bring together various dryland stakeholders such as researchers, extension agents and the local community as a forum for sharing ideas and thinking together to initiate well-perceived activities to solve incessant dryland problems. Through various activities such as workshops, training sessions, action research, demonstrations and indigenous knowledge thrusts, attempts were made to address the plight of drylands with the objective of achieving sustainable management of these fragile lands. A number of long term and short term objectives were thus addressed through the support of local initiatives and institutions. These are income generation, creation of employment, food security and alleviation of poverty. Sound management, utilisation and conservation of indigenous resources were part of the main agenda of the Project. It is believed that the Project has, to some extent, a substantial positive impact on the quality of live of the local community through livelihood improvements.

The Project broadly fitted into the national programme initiatives by complementing its activities with the local district development priorities. Thus, it can be confidently concluded that the Project has carried out its planned activities. Moreover, it has equally been an integral part of the national development strategies as viewed through its complementing and integrative activities with those of the district development plans. The cross-cutting issues addressed by DHP-Kenya and the Ministries of Livestock, Agriculture, Natural Resources and Water attest to the relevance of DHP-Kenya to the long term development strategies of the country, in general, and those of the local communities in the southern rangelands of Kenya, the Project area, in particular.

The Project's achievements were enhanced by its interaction, inter-linkage and collaboration with other development agents such as the German Agro-Action (GAA), Intermediate Technology Development Group (ITDG), Action Aid, Adventist Development Research Agency (ADRA), and African Medical Research Foundation (AMREF). As a strategy for success, DHP-Kenya also cultivated good working relationships with local public institutions such as the Kenya Agricultural Research Institute (KARI), Kenya Forestry Research Institute (KEFRI) and many others to ensure that it provided complementary and synergistic services for the development of the affected community. Within the IGAD region, DHP-Kenya established linkages with other programmes addressing the broad pastoral and agro-pastoral development issues. One such project is the Pastoral Information Network Project (PINEP), concerned with training, research and information dissemination. Within this collaboration, DHP-Kenya's research and extension policy dialogue activities were tested and documented.

DHP-Kenya had published a number of annual reports, manuals and journal articles as major means of verification and outputs. The training of community persons, such as the paravets or Community Animal Healthcare Workers (CAHWs) and pastoral development agents (PDAs) complemented the outputs. These were further strengthened by the empowerment of the local self-help groups (SHGs) with a strong gender-orientation to ensure balanced utilisation of gender strengths for strong family and community functions.

This book contains DHP's activities and experiences in Kenya since its inception in 1995.

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CHAPTER 1

INTRODUCTION

Background to Dryland Husbandry Project

The Dryland Husbandry Project (DHP) came into being under an arrangement conceived by the Inter-Governmental Authority on Drought and Development (IGADD), which changed later to Inter-Governmental Authority on Development (IGAD). IGAD was established in 1986 by Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda as a platform for regional co-operation concerning environment and development. In January 1992, IGAD formerly requested support for a regional range management programme to implement a consolidated five-year plan, focusing on food security and environmental protection. An identification mission launched by the Swedish International Development Agency (Sida) in February 1992 explored the joint interests and basic concepts for co-operation related to dryland husbandry within the framework of IGAD's five-year plan. This was followed by Sida-supported project preparation based on the results of the exploratory mission. Uppsala University research programme on Environmental Policy and Society (EPOS) assisted IGAD and selected participating institutions in the member countries in the preparation of a regional Dryland Husbandry Programme to address environmental and associated socio-economic problems in the region.

The Kenyan component of the Dryland Husbandry Project (DHP-Kenya) is a collaborative effort between the Department of Range Management of the University of Nairobi, the Organisation for Social Science Research in Eastern and Southern Africa (OSSREA) and Environmental Policy and Society (EPOS). It was started in line with Kenya's National Dryland Management objectives, which are threefold:

- To develop the national capacity for extracting the substantial production potential of pastoral areas, thereby contributing significantly to the national goals of income generation, employment creation and the attainment of food security
- To reclaim and protect the diverse, valuable and fragile ecology of the drylands
- To create a productive environment with opportunities for improving the quality of life for the present and future pastoralists on a sustainable basis

The short-term objectives of DHP are to provide:

- A venue for interaction among researchers, extension agents and pastoralists
- Trials on new land management practices for community-based range improvement
- Training of Pastoral Development Agents (PDAs) and Veterinary Scouts (VSs)

Bio-Physical Environment of the Project Area

Location and Size

The Project area is in Greater Kibwezi Division, Makueni District. Makueni District was carved from Machakos District in 1992 and is one of the thirteen districts that form Eastern Province. It is one of the four districts that comprise the Ukambani Region. The district borders Kajiado District to the west, Taita Taveta to the South, Kitui to the East and Machakos to the north (see more details in Table 1.1).

Table 1.1 Area and Population Density by Division

Division	Area (km^2)	Location	Sub-location	Population density 2002
Wote	362.7	2	8	121
Kathonzweni	880.7	6	16	81
Kalawa	330.0	4	14	87
Kisau	301.2	3	12	183
Nguu	350.3	5	15	60
Makindu	880.2	4	15	62
Mtito-Andei	931.2	4	6	78
Kibwezi	944.8	4	14	92
Tulimani	126.0	1	6	283
Mbitini	229.7	6	23	230
Kasikeu	270.9	3	8	209
Kilungu	178.3	5	13	413
Kaiti	239.8	5	12	209
Mbooni	141.6	4	11	430
Matiliku	240.6	4	7	176
Kilome	359.4	3	7	140
Tsavo West	474.1			
National Park	724.3			
Chyullu Game Reserve				
Total	7,965.8	63	187	

SOURCE: Office of the President, Makueni District (2001).

Kibwezi Division is situated about 200km southeast of Nairobi. The altitude of the area varies from 600m to 1,100m a.s.l. The actual location of the division is at the southern portion of Makueni District of the Eastern Province (Fig. 1.1). The area was not inhabited until the 1930s due to its low agricultural potential and heavy infestation by tsetse flies. Kibwezi Division covers 47% of the Makueni District and has a total area of 3,400km^2, according to the Central Bureau of Statistics (1981, 1986). It has five locations, that is, Makindu, Kikumbulyu, Ngwata, Masongaleni and Mtito Andei. The area lies in agro-climatic and ecological Zone V of Kenya (Braun, 1977; Pratt and Gwynne, 1977). It is characterised by low and unreliable rainfall, marginal agricultural lands, dispersed population and poor soils. The principal means of communication in the area is the Nairobi-Mombasa road, railway line and many dry weather roads adjoining them (Michieka and Van Der Pouw, 1977).

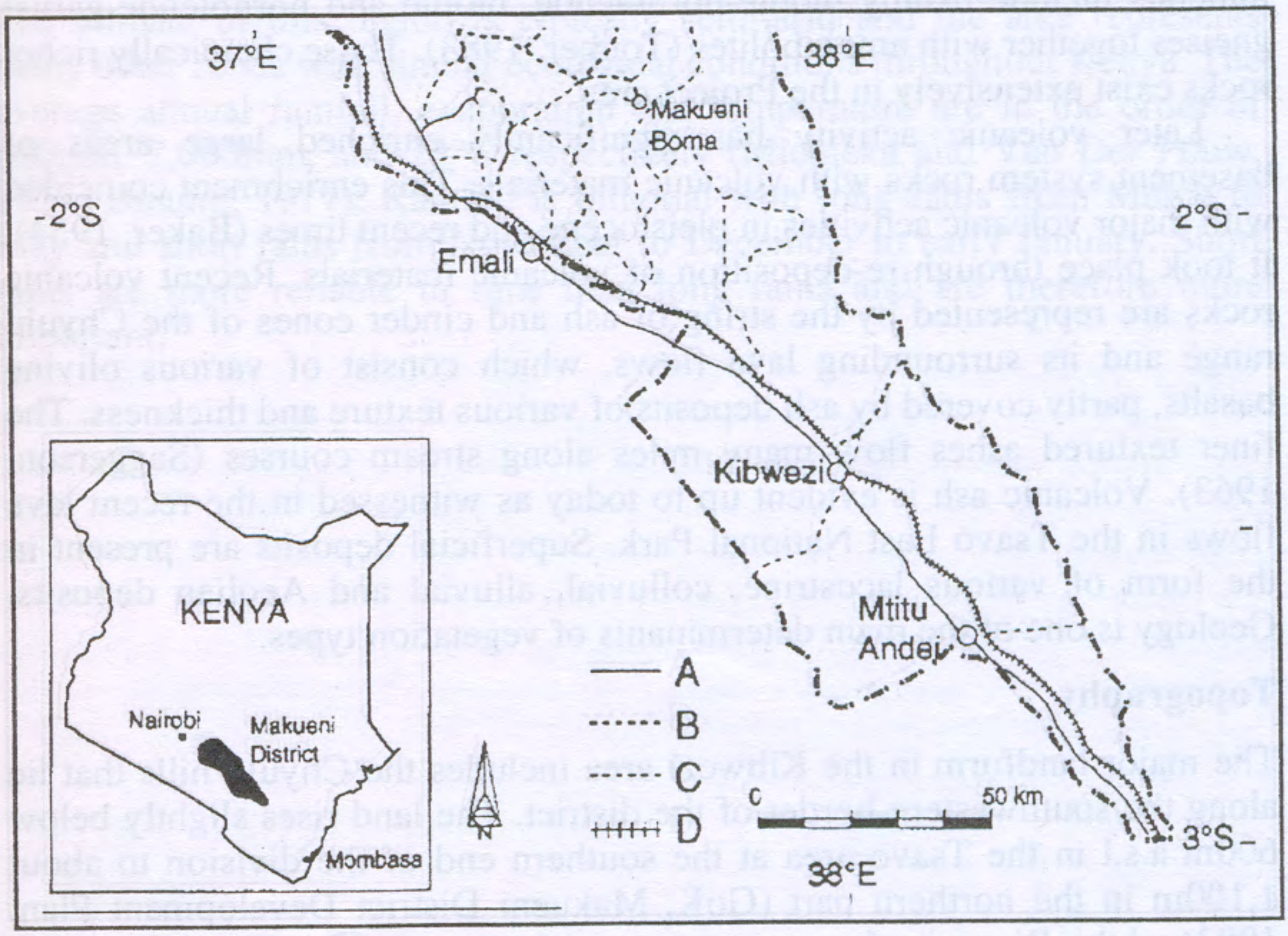

Fig. 1.1. Location of Makueni District and Infrastructure: A—Tarmac Roads, B—Loose All-weather Roads, C—Other Roads, D—Railway Line

Geology

The Greater Kibwezi Division is composed of recent volcanic rocks under the basement complex system. Granitic rocks are found around Chyulu hills. According to Michieka and Van Der Pouw (1977), half of the area belongs to the erosional plain of undifferentiated basement system gneises which are of Archean age. The rest of the area is almost entirely built up of recent lava flows and some volcanic cones. Flood plains and bottomlands occupy only minor portions. The rocks of the area can broadly be subdivided into basement system rocks, volcanic and superficial deposits (Touber, 1983).

The Precambrian basement system rocks are composed almost entirely of gneises, except for some small areas with crystalline limestone (Saggerson, 1963). The gneises can be sub-divided into gneises that are poor in ferromagnesian minerals and gneises rich in ferromagnesian minerals. The former is composed mainly of quartz-feldspar and granitoid gneises which are chemically poor. The gneises rich in ferromagnesium minerals include mainly biotite-hornblende, biotite and hornblende-garnet gneises together with amphibolites (Touber, 1983). These chemically richer rocks exist extensively in the Project area.

Later volcanic activity has significantly enriched large areas of basement system rocks with volcanic materials. This enrichment coincided with major volcanic activities in pleistocene and recent times (Baker, 1954). It took place through re-deposition of volcanic materials. Recent volcanic rocks are represented by the string of ash and cinder cones of the Chyulu range and its surrounding lava flows, which consist of various olivine basalts, partly covered by ash deposits of various texture and thickness. The finer textured ashes flow many miles along stream courses (Saggerson, 1963). Volcanic ash is evident up to today as witnessed in the recent lava flows in the Tsavo East National Park. Superficial deposits are present in the form of various lacustrine, colluvial, alluvial and Aeolian deposits. Geology is one of the main determinants of vegetation types.

Topography

The major landform in the Kibwezi area includes the Chyulu hills that lie along the southwestern border of the district. The land rises slightly below 600m a.s.l in the Tsavo area at the southern end of the division to about 1,100m in the northern part (GoK, Makueni District Development Plan, 1993). Athi River is the major perennial river in the district, and its tributaries—Kambu, Kibwezi, Kiboko and Mtito Andei Rivers—drain the Kibwezi Division (Fig. 1.2). Savannah grasslands characterise the division with mostly low-lying, gently eastward-sloping plains towards Athi River, broken by occasional hills and seasonal and perennial rivers.

Soils

According to Michieka and Van Der Pouw (1977), red to brown sandy clay soils prevail in erosional plains. They are mainly Ferralsols, but Nitosols, Luvisols and Cambisols also exist. Most of these soils are compact and have a massive structure with strong surface sealing, which causes much runoff during heavy rains. The soils of volcanic origin are shallow to very shallow, extremely stony to rocky and are highly permeable. The soils of the flood plains and bottom lands range from calcareous and non-saline to extremely calcareous and saline. Occasional pockets of black cotton soil characterised by high clay content are scattered here and there in the bottom lands. The soils of Kibwezi are Ferral-Chromic Luvisols (Touber, 1983). They are well drained, moderately deep, dark reddish brown with well-developed A-horizons. The A-horizons have a characteristic dark reddish brown colour and sandy clay loam to sandy clay texture.

Climate

The climate of this region is typically semi-arid and the area represents many other zones with similar ecological conditions throughout Kenya. The average annual rainfall, evaporation and temperature are in the order of 600mm, 2,000mm, and 23°C respectively (Michieka and Van Der Pouw, 1977; Braunn, 1977). Rainfall is bimodal with long rains from March to May and short rains from November to December to early January. Short rains are more reliable in time than long rains and are therefore more important.

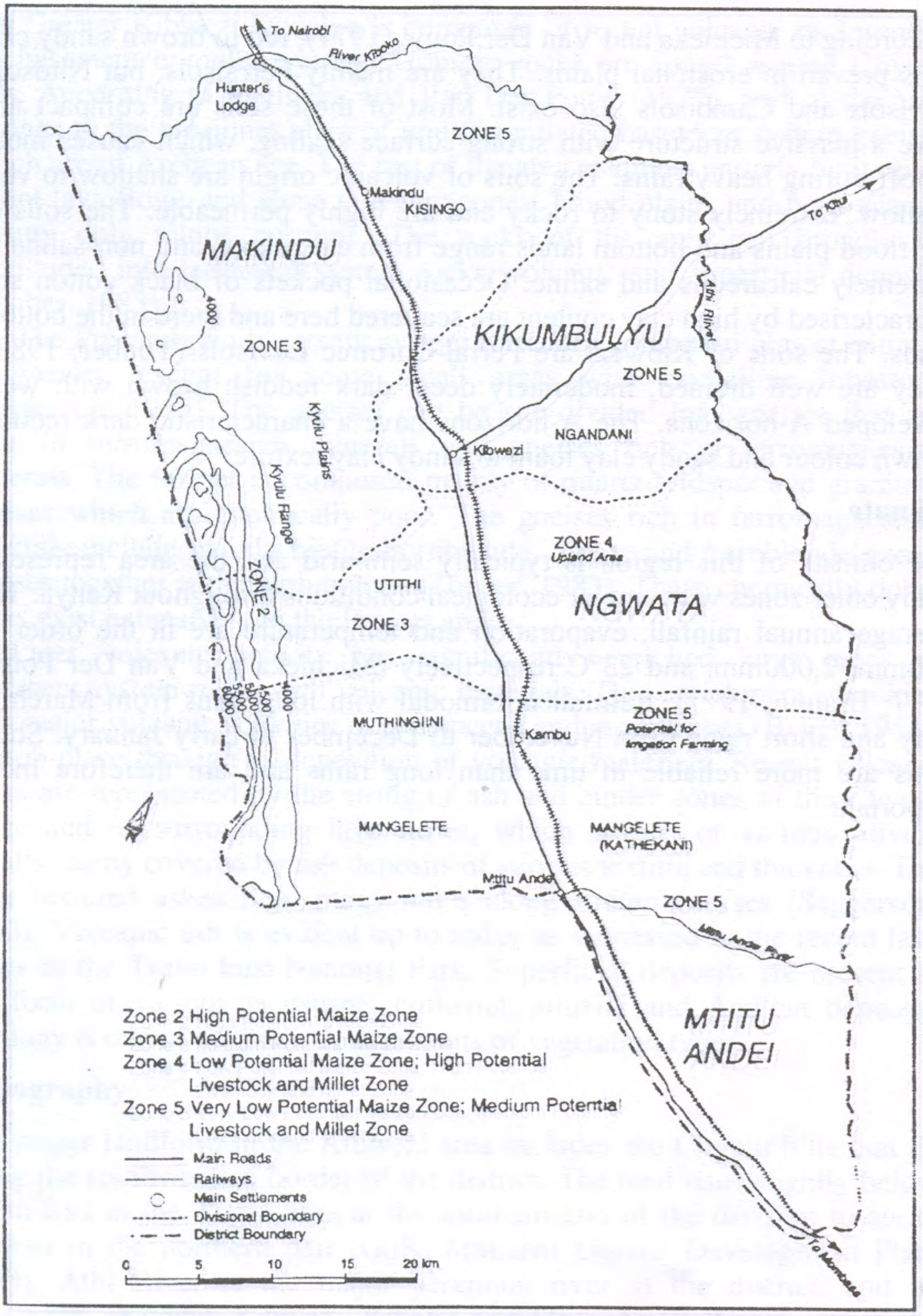

Fig. 1.2 Major Agro-ecological Zones in the Greater Kibwezi Division

Although temperature varies with altitude, the division is generally hot. High temperatures are expected during daytime and low temperatures during nights. During the dry periods, i.e., between May and October, the division experiences intense heat, less wind and a high evapotranspiration rate. Highest mean temperatures (32–33°C) prevail during February–March, while the lowest (15–16°C) during July–August (GoK, 1993).

Braunn (1978) showed that there is a concentration of rainfall at the beginning of the long or short rains. There is a lot of variability in rainfall amounts both in time and space and its reliability is low. Kibwezi Division covers the most southerly part where the mean rainfall may be less than 600mm.

Agro-Ecological Zones

The major agro-ecological zones in Greater Kibwezi are sorghum/millet/livestock zone (LM 5), ranching zone (LM 6), marginal cotton zone (LM 4), main cotton/marginal cotton zone (LM 3-4), IL 6, LH 2 and LH 4 (GoK, 1993). The agro-ecological zones according to Jaetzold and Schmidt (1983) are shown in Fig 1. 2. The LM 5 and LM 4 that are covered by reddish clay soils and black cotton soils are used for cotton, sisal and millet. Livestock rearing is also practised. LM 6 is suitable for millet growing and livestock rearing.

Vegetation, Livestock and Crops

Vegetation

The distribution of the vegetation in the area is controlled by a number of complex interrelated factors such as, climate, geological formation, soil type and the presence or absence of ground water (Gachimbi, 1990). Man, through cutting trees, clearing, burning and grazing is the most important factor that has modified the original vegetation. According to Pratt and Gwynne (1977) and Touber (1983), it is a typical semi-arid rangeland dominated by Commiphora, Acacia and allied genera, mainly of shrubby habitat. Baobab trees (Adansonia digitata) are common. In understanding the population dynamics of the baobab in the Project area, the density of this species was determined in both the disturbed and undisturbed land (two sites) and the results are summarised in Table 1.2. A comparison of the two sites showed that they are not different at ($P<0.05$). The socio-economic uses of *Adansonia digitata* are discussed elsewhere in this text.

Table 1.2 Mean Number of Baobab Plants per Hectare

Transects	1	2	3	4	Average
Length (km)	2.1	2.5	1.9	1.8	2.1
Site I	0.5	2.6	0.7	0.6	1.1
Site II	0.9	0.6	0.3	0.6	0.6

Perennial grasses such as *Cenchrus ciliaris*, *Enteropogon macrostachyus* and *Chloris roxburghiana* can dominate but many succumb to continuous abuse over a long period. Intermediary or several stages of succession exist with herbaceous woody vegetation and grasses such as *Eragrostis superba* in previously cleared sites. Bottom lands dominated by black cotton soils are characterised by *Pennisetum mezianum* at the lower storey and *Acacia drepanolobium* at the middle storey.

Livestock and Crops

Livestock herds are composed of cattle, sheep and goats. During the wet season, the animals depend on free access grazing for sustenance. Physical overlapping of the pastoral and agronomic sectors takes place in the dry season when livestock are temporarily moved into cultivated fields to utilize crop residues (GoK, 1993). Rabbit production, poultry production and beekeeping are also undertaken. Mbinda (1992) found out that a vast majority of farmers (97%) keep poultry, a few (9%) keep donkeys for transport, and about 35% keep bees in hives constructed from hollowed-out logs. Crop production is minimally carried out, with crops such as *Katumani* maize, pigeon peas and sorghum. Small-scale irrigation of horticultural crops is carried out in some parts of the division (GoK, 1993), especially along the Athi River and its tributaries.

Demography, Settlement Patterns and Economic Potential

The People and their Life Style

The largest ethnic group in the Project area is the Kamba. As in the pre-colonial times, they depend partly on a pastoral and agronomic economy to meet most of their needs (Munro, 1975). Most production systems include cultivated plots and access to communal grazing lands.

Between 1925 and 1936, the colonial government declared as Crown Land areas settled by the Kamba around and on Ngulia hills (present-day areas of Ngulia Lodge in Tsavo National Park), which are still traditionally recognised as part of Kambaland. Although most of the people migrated due to pressure by the government, some people remained, especially in Chyulu hills (Mbithi and Barnes, 1975).

Before 1961, most of the areas in Kibwezi Division were unoccupied and uncultivated. For example, in 1948, the Ngwata location, which is mainly made up of bush/scrub/grazing land and forest, was virtually unoccupied. By 1961, most of the forest in the division and around the district had been cleared to pave way for cultivation. In 1978, a wave of settlements from the north of the district and the neighbouring districts of Machakos and Kitui had brought 20% of the area under cultivation. In the same period (1961–1978), bush encroachment increased from 52–62% and the amount of forest decreased by 62% (Tiffen, 1991; Rostom and Mortimore, 1991).

By 1964, the people had begun returning to the area between Kibwezi and Mtito Andei and the area was designated for settlement. No other section in Ngwata (part of the Project area) had been formally settled although squatters had established their own administrative system for settling newcomers. This unorganised settlement led to the present land deterioration prevalent in the area (Mbithi and Barnes, 1975).

The newly opened settlement schemes in Kibwezi Division (Kibwezi, Masongaleni, Kiboko and Nguu Ranch) have caused a large influx of people from other divisions and surrounding districts, thus soaring the population density in the division. A case in point is the settlement of squatters in the Masongaleni and Kiboko settlement schemes where squatters from Machakos and other surrounding areas were settled in 1992 (GoK, 1993).

Population

According to the Central Bureau of Statistics (2000), Kibwezi has an area of 3,400km^2 and a human population density of 85 persons per km^2 (GoK, 2000). Although this density is much lower than in the neighbouring medium potential areas such as Wote Division which had a population density of 111 persons per km^2 in 1999, this is a high figure for Kibwezi Division which is marginal and of low potential (Central Bureau of Statistics, 2000).

FAO (1982) recommends semi-arid areas to support 7 persons/km^2 at low input of technology, 21 persons/km^2 at intermediate level technology and 98 persons/km^2 at high level technology, which is not available in such areas. The potential population density of semi-arid areas is given as 21 persons/km^2 and this is when all measures are instituted to prevent the occurrence of natural catastrophes or setbacks against utilisation of available resources. The main problems in the area are lack of water, capital and labour to make land productive (Ferguson *et al.*, 1985).

The population structure is made up of 50% young people (0-14 years) and 5.2% population above 59 years. From these figures, it is apparent that the dependency ratio in the division is approximately 124:100, i.e., every